# Electrical Service Options for Residential Customer EV & PHEV Users

Sven Thesen
Supervisor, Clean Air Transportation
Pacific Gas & Electric Company
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# Overview

- Intro - PG&E
- Study
- Results
- Conclusion

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# Introduction

PG&E has a wide range of clean energy programs that address air pollution and global climate change, including pollution prevention, energy efficiency, the use of renewables and the promotion of clean air transportation alternatives for our customers.

Clean Air is Good for All of Us!


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# PG&E

- Serves 15 million people in Northern and Central California
- 2007: Largest Alternative Fueled Utility Fleet in Nation
- Continually looking to expand fuel alternatives


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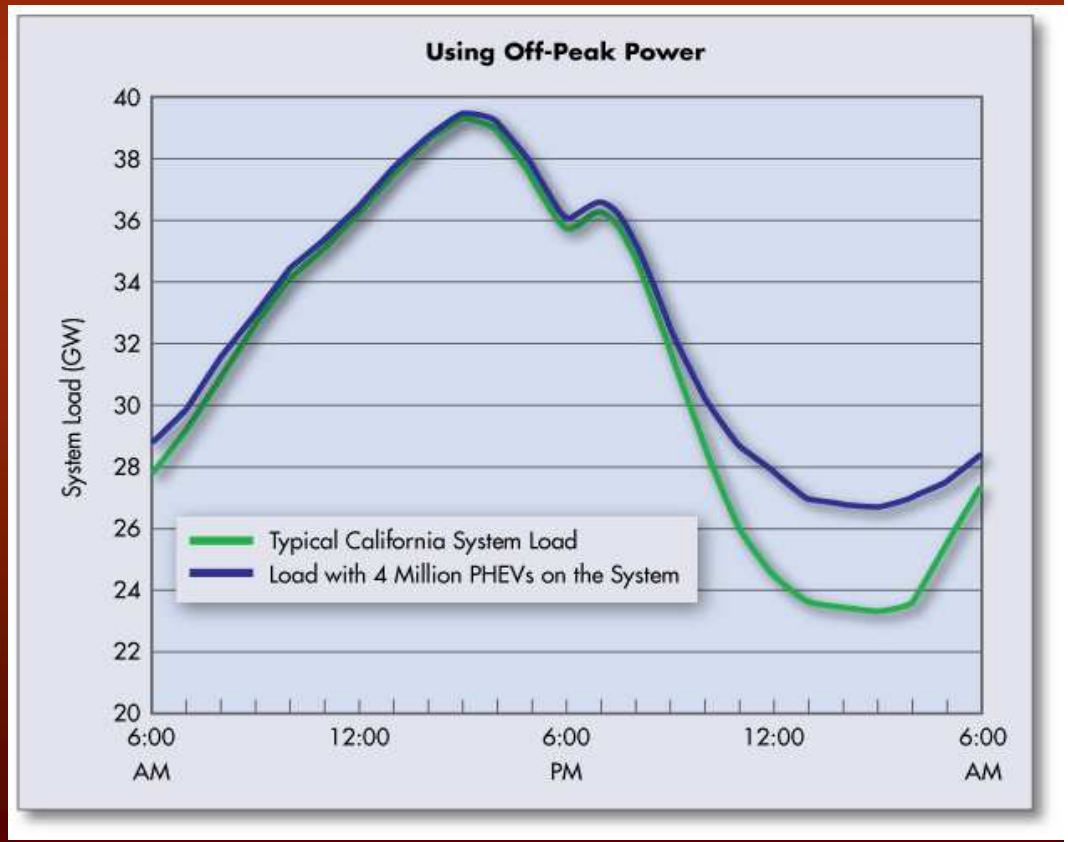
# Why EV Rates are Important

Means to:

- Minimize EV & PHEV impact to grid
- Increase electrical system efficiencies

By:

- Providing economic incentives & disincentives for consumers
- Bifurcating EV use from home use

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# Survey Study of Residential EV &/or TOU Electrical Rates

- Surveyed California's 21 largest electric utilities, representing 99% of the residential electricity delivered
- 6 general questions focusing on:
  - EV and/ or TOU Rate availability
  - Any associated costs
- Majority have EV and/or TOU rates available

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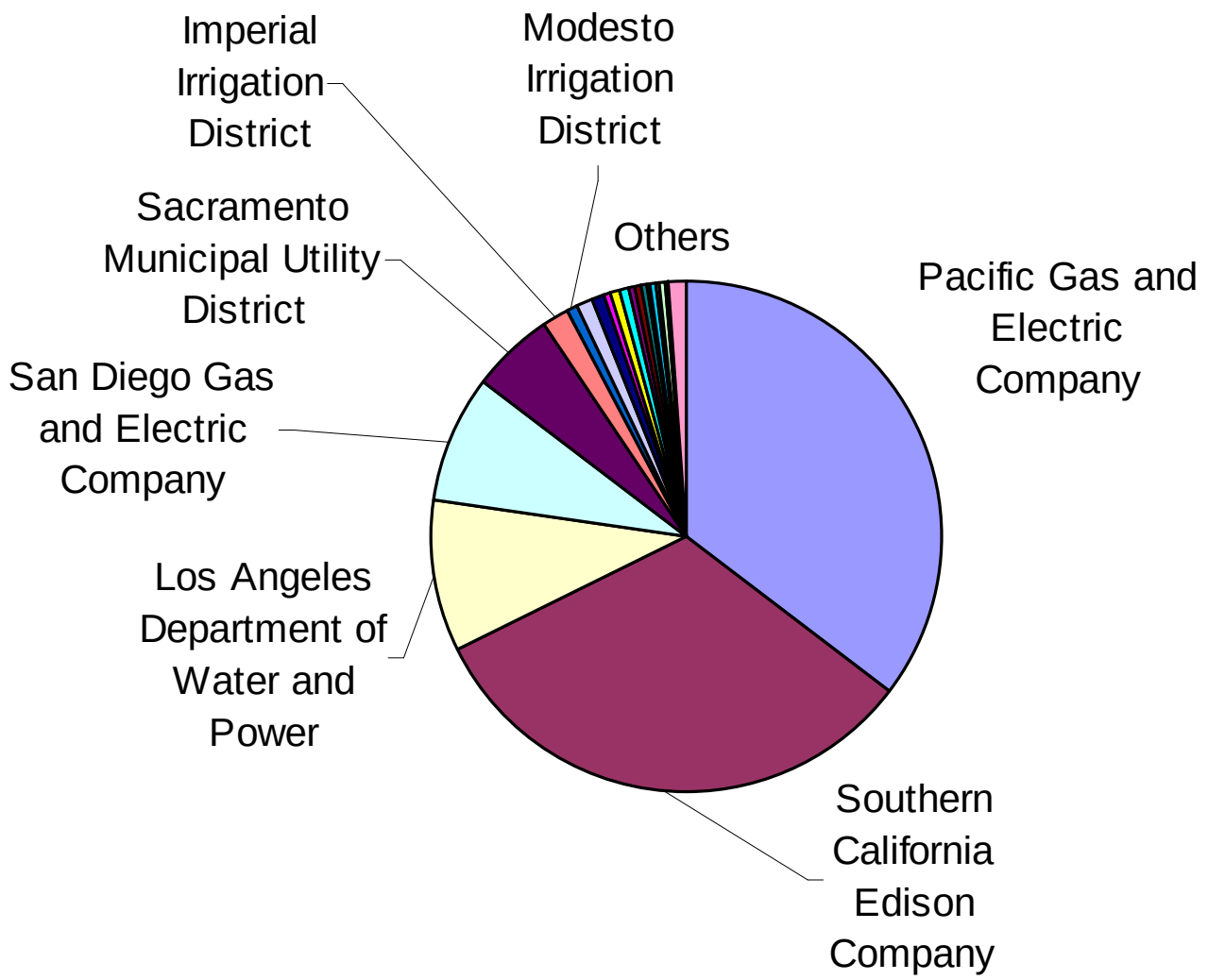
# California Utilities

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# Study Results

- 10 of the 21 utilities had either a EV-TOU rate, a EV rate, or a TOU rate
  - 5 had EV-TOU rates
  - 2 had EV specific rates
  - 3 had TOU rates
- The 5 utilities with EV-TOU rates cover 90.5% of the residential electricity delivered
- The 10 utilities cover a combined 92.6%

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# Utilities with EV/TOU Rates

| Utility | TOU Rate? | % Residential |
|---|---|---|
| Pacific Gas & Electric Company | Yes, and EV specific | 35.31 |
| Southern California Edison Company | Yes, and EV specific | 32.38 |
| Los Angeles Department of Water & Power | Yes, and EV specific | 9.59 |
| San Diego Gas and Electric Company | Yes, and EV specific | 8.02 |
| Sacramento Municipal Utility District | Yes, and EV specific | 5.19 |
| Riverside Public Utilities | Yes | 0.78 |
| City of Glendale | Yes | 0.51 |
| City of Pasadena | Yes | 0.36 |
| City of Burbank | No, but EV rate | 0.33 |
| Alameda Power & Telecom | No, but EV rate | 0.17 |
| TOTAL | | 92.64 |

# Electrical Rates

- Rates varied by utilities, seasons, and time periods
  - Lowest: Winter off-peak: $0.0468 / kWh
  - Highest: Summer high peak: $0.33 / kWh
- Ranges between off-peak and on-peak varied
  - Smallest difference: $0.01 / kWh
  - Largest Difference: $0.25 / kWh

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# Electrical Rates

- Rate seasons, if part of the rate structure, typically had a 2 seasons:
  - Winter (November through April)
  - Summer (May through October)
- Days were split up into 2 or 3 time periods
  - 3rd peak classified either as partial peak or super off-peak
  - Weekends were sometimes considered off-peak hours

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# Minimum and Max Rates ($/kWh)

| | Min | Max |
|---|---|---|
| Winter Off-peak | 0.0468 | 0.0800 |
| Winter On-peak | 0.0664 | 0.1756 |
| Summer Off-peak | 0.0497 | 0.0800 |
| Summer On-peak | 0.0813 | 0.3300 |

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# Example: PG&E's TOU Summer time periods

| | 12am | | 7am | | 2pm | | 9pm | 12am |
|---|---|---|---|---|---|---|---|---|
| Monday | Off peak | | Partial Peak | | Peak | | | Partial Peak |
| Tuesday | | | | | | | | |
| Wednesday | | | | | | | | |
| Thursday | | | | | | | | |
| Friday | | | | | | | | |
| Saturday | | | | | | Partial Peak | | Off Peak |
| Sunday | | | | | | | | |

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# Dual Meter Options

- Allows “residential uses” to remain on the residential rate while the EV (& ?) takes advantage of the TOU rate
- Offered by 5 largest utilities

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# Dual Meter Additional Costs

- Some Utilities charge for the 2nd meter installation, some a monthly fee
- Customer responsible for additional wiring costs
- Anecdotal evidence indicates a number of customers have opted to avoid the additional costs & stay with one meter & the TOU rate

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# Advanced Meter Initiative

- TOU Meter with communication between the meter and appliances (ie, PHEVs), and with the utility.
- Provides customer with information on usage, and eligibility for rate discounts.
- Rollout from 2007 through 2012.

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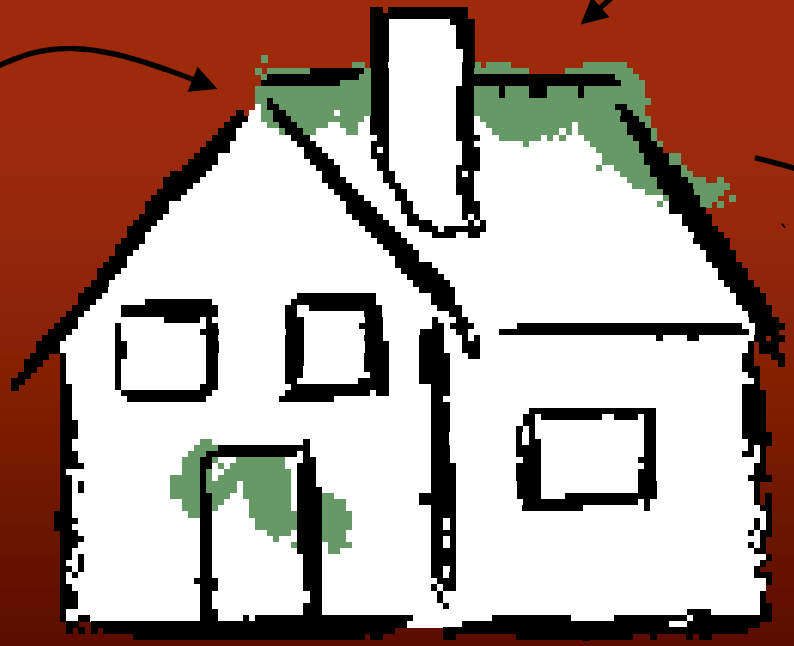
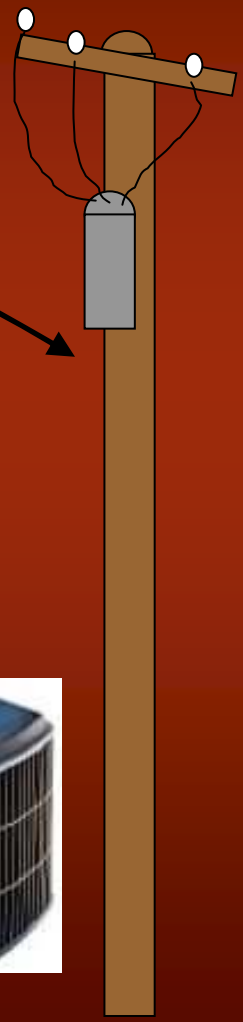
# The Future





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# Conclusions

- EV rates available to most of California's residents
- Significant variation among rates
- Generally provides economic incentives and disincentives to improve the grid's efficiency

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# Conclusions

- Modifications to EV rates/procedures may be needed to accommodate EVs & PHEVs.
- AMI may further enable rate incentives for off-peak charging of EVs with greater flexibility for the customer.
- As batteries improve, look to incorporating Vehicle to Grid (V2G) options in the EV rate structure.

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# Thank you

Sven Thesen
Supervisor, Clean Air Transportation
PG&E
(415) 973-1048
sxtg@pge.com

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